

## New synonyms in specific names of frogs (Raninae) from the border regions between China, Laos and Vietnam<sup>1</sup>

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Species pairs described on either side of the Chinese/Vietnamese-Lao border are compared and the following new synonyms are proposed: *Rana daorum* is a subjective junior synonym of *Amolops mengyangensis* and the valid name of the species is *Amolops mengyangensis*; *Rana hmongorum* is a subjective junior synonym of *Rana jingdongensis* and the valid name of the species is *Odorrana jingdongensis*; *Rana megatympanum* and *Rana heatwolei* are subjective junior synonyms of *Rana tiannanensis* and the valid name of the species is *Odorrana tiannanensis*; *Rana nigrolineata* is a subjective junior synonym of *Rana lateralis* and the valid name of the species is *Pelophylax lateralis*; *Rana nigrotympanica* is a subjective junior synonym of *Rana cubitalis* and the valid name of the species is *Sylvirana cubitalis*; *Rana bannanica* is a subjective junior synonym of *Rana milleti* and the valid name of the species is *Sylvirana milleti*. Evidence from morphological and morphometrical study of type material and topotypical material is given. Attention is drawn to the fact that taxonomy is an international endeavour, and that describing new taxa often requires knowing the fauna of neighbouring countries.

### INTRODUCTION

Preliminary to any systematic work we need to define the samples we have to study. Some groups may be of small size, so there is no major problem to compare all their members. Others may count numerous species and taxonomic delimitation may be very poor. In some cases also allocation of an observed taxon to a particular group will be difficult, and in the end no relevant comparison will be done.

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Another fact is that in recent years many new species have been described and the discovery of many more is expected (KÖHLER et al., 2005), which suggests to the taxonomist that what he has in his hands could be probably new. And it can, but sometimes it won't. Thirty percent of the amphibian species are poorly known, only the original description and a few old records are available and no proper figure or photograph have been published.

Many authors focus on the southern limit of Oriental region, known as the Wallace line (OOSTERZEE, 1997), but the north-eastern limit of this region is still more problematic and quite unique among realms. Over a distance of several thousands kilometers, no geographic limits, such as deserts or high mountains, exist between the Palearctic realm and the Oriental realm, so that an intergradation zone of roughly 1500 km has developed. In fact in a large zone, including central and southern China, northern Vietnam and small parts of northern Laos, north-eastern India, northern Thailand and northern Myanmar, members of the two faunas co-exist in the same habitats (*Hyla sensu stricto*, *Rana sensu stricto* are found along with *Xenophrys*, *Odorrana*, etc.), and members of both faunas might have their major centre of diversification in this region (e.g., in *Hyla* and *Xenophrys*).

The border between China on one hand, and Laos and Vietnam on the other, has been used as a limit for biogeographical investigations (INGER, 1999; ZHAO, 1999), although it does not correspond to any natural limit. In many studies by Chinese authors, insufficient comparison with the Indochinese species has been done due to work in isolated conditions, so that synonyms have been created, some of which still need to be clarified. In recent times, taxonomic works have been carried out in Vietnam without comparison to the Chinese fauna (BAIN et al., 2003), thus again creating new names for already named species.

Another problem of the work of BAIN et al. (2003) is that, although they provided comparisons to many of the "stream frogs" from the Oriental region, they did not refer to the voucher specimens they studied, nor gave the geographical origin of these specimens. In consequence, verification of specific allocation of these species cannot be carried out and distinctive characters might be useless or uninformative in some cases (see below for *Rana himongolensis*). Use of such specimens for further analyses, such as phylogenetic hypotheses and classificatory proposals based on them (FROST et al., 2006), introduces important doubts about the results obtained.

The aim of this study is to confront information in some pairs of nominal species of the Oriental region in order to understand taxonomic allocation of specimens to biological species and to have additional data on their distribution. In many cases this provides more data on biology and conservation of the species, as often one of the two species is better known. In this first clarification (to be followed by others), pairs of names available for six ranine frogs of the genera *Amolops*, *Odorrana*, *Pelophylax* and *Sylvirana* will be discussed.

## MATERIAL AND METHODS

### MATERIAL

See appendix 1.

## CLASSIFICATION

FROST et al. (2006) published an important and necessary work in presenting a tree of all amphibians. Nevertheless the sampling is not equally distributed and the Oriental ranid frogs are particularly poorly represented as compared to the diversity of lineages. In conclusion, FROST et al. (2006) decided to lump large groups of frogs (e.g., Hua Yang, 1991) but kept other lineages apart without any evidence beside original definition (e.g. *Pterorana* Kiyasetuo & Khare, 1986). For this reason, I here still keep the groups proposed as subgenera by DUBOIS (1992), but use them as genera *Odorrana* Fei, Ye & Huang, 1990 (type species by original designation *Rana margaretae* Liu, 1950) is applied here to a group of frogs with its centre in China and northern Vietnam and northern Laos. These frogs are stream-living species with long legs, but shorter than in *Amolops* Cope, 1865. In particular they can be distinguished by the shape of their toe pad grooves which always show a little terminal gap in *Odorrana* (OHLER & DUBOIS, 1989). Their tadpoles have neither abdominal suckers nor glands on head and back; they show 4 rows of keratodonts on lower lip. *Hua* as defined by YANG (1991a) is a group of frogs with tadpoles bearing abdominal suckers and with adults having longer legs than those of *Amolops*. It was originally erected for species from Borneo, Java, Thailand and Yunnan. YANG (1991b) added *Rana nasua* Boulenger, 1903 to this genus on the basis of tadpoles allocated to this species, but identity of these tadpoles was supported by morphological evidence only. Thus the taxonomic allocation of this species must be studied again on properly identified specimens and *Rana nasua* cannot be used as voucher for *Hua* as done in FROST et al. (2006). Allocation of recently described frogs to *Hua* must be re-evaluated in further works as it was done on adult morphology only, and as taxonomic conclusions were not based on type species but on species that might be phylogenetically closer to other clades than to that containing *Rana cavitimpanum* Boulenger, 1893 (type species of *Hua* Yang, 1991 by original designation).

## METHODS

For most of the name-bearing types of the Oriental region, detailed description and photographs of the specimens are available at MNHN. These descriptions will be published elsewhere, in particular in a revision of *Silurana* (OHLER & DUBOIS, in preparation). For recent names, good original descriptions are available. Morphological comparison of type material, topotypical material and specimens from various localities in the Oriental region was carried out based on voucher specimens or descriptions. Morphometric measurements of basic characters such as snout-vent length (SVL), head width (HW), head length (HL), tibia length (TL) and tympanum diameter (TYD) were made if necessary and are compared with published measurements. The following terms are used in the synonymies below (DUBOIS, 2006): *holotype* (SIMPSON, 1940) for a set of specimens used by an author to establish and describe a new species, *onomatophore* (SIMPSON, 1940) for the name-bearing type of a taxon, *onymotope* (DUBOIS, 2005a-b) for the type locality of a species.

Contrary to the methods available to point to differences, there is no methodology for the definition of synonyms. A synonym clearly cannot be defined as "identical", as within a biological species different kinds of morphological variation (sexual dimorphism,

ontogenetical variation, life stages) occur, caused either by genetic or by epigenetic factors, or both. To establish synonymy, we need information on the intraspecific variation in order to show that the synonymous taxon falls within the range defined for the other taxon. But often the data available on various species are very poor (about 30 % of "data deficient" species in the Global Amphibian Assessment, STUART et al., 2004). Also as in an example below, males of one taxon and females of another taxon might be available and thus no direct comparison possible. In such a case, sexual dimorphism must be evaluated by comparison with phylogenetically close taxa.

A very particular problem in anurans is intraspecific variation in size. DUBOIS (1976) proposed a *ratio of extreme values* (RE) which divides the size of the largest known specimen of a species by the smallest known of this species. If applied to species recognized on biological criteria as the treefrogs of the genus *Hyperolius* Rapp, 1842 described by SCHIOTZ (1999), RE of adult male frogs varies from 1.04 to 1.56. In *Arixalus* Laurent, 1944 the value of RE is between 1.11 and 1.42. A value of 1.5 means that the smallest male has a SVL of two thirds of that of the largest known male. The sole presence of size variation cannot be used as a taxonomic argument. It may be due to variation in presence of age classes in a particular population or to variation in external factors such as predation or harvesting. On the other hand, size, independent of its origin, is linked to allometric variation in different body parts such as tibia length, head shape, etc., and might lead to differences in relative size of various body parts. If the sample is large enough, detailed analysis on growth can be made especially using comparison of slopes of allometric growth curves. But on small samples, which are often the samples we have to deal with in taxonomy, systematic studies can have only poor arguments. Nowadays, size variation alone is not considered a sufficient argument for defining a species. Like any other character, only its correlation to other characters will be considered as sufficient support to indicate genetic isolation of a group of frog to others such groups, and its meaning will be different in situations of sympatry, parapatry or allopatry.

## ABBREVIATIONS

### *Collections*

BMNH – The Natural History Museum, London, United Kingdom  
 CIB – Chengdu Institute of Biology, Chengdu, China.  
 FMNH – Field Museum of Natural History, Chicago, USA  
 KIZ – Kunming Institute of Zoology, Kunming, China  
 MAS – Malcolm A. Smith collection  
 MNHN. – Muséum national d'Histoire naturelle, Paris, France  
 MSNG. – Museo di Storia Naturale di Genova, Genova, Italy  
 ROM. – Royal Ontario Museum, Toronto, Canada  
 ZSI – Zoological Survey of India, Kolkata, India

### *Abbreviations used in text and tables*

♂ – Adult male  
 ♀ – Adult female  
 alt – Altitude above sea level (in metres)  
 n. – Sample size

HL. – Head length  
 HW. – Head width  
 SVL. – Snout-vent length.  
 TL. – Tibia length.  
 TYD. – Tympanum diameter

## TAXONOMIC DISCUSSIONS

### *Amolops mengyangensis* Wu & Tian, 1995

*Amolops mengyangensis* Wu & Tian, 1995: 50. HYPODIGM: 3 ♂ – ONOMATOPHORE Holotype, by original designation, CIB 579034, ♂, SVL 38.7 mm (personal observation) – ONYMOTOPE Mengyang (22°04'N, 100°53'E; alt. 680 m), Xishuanbanna Daiizu Zizhizhou, Yunnan Sheng, China.

*Rana daorum* Bain, Lathrop, Murphy, Orlov & Ho, 2003: 38. HYPODIGM: 48 ♂, 10 ♀, 1 subadult ♀ – ONOMATOPHORE Holotype, by original designation, ROM 26381, ♀, SVL 55.7 mm – ONYMOTOPE, Approximately 5 km NW of Sa Pa Village, near O Qui Ho Pass (22°20'09"N, 103°50'14"E, alt. 1400 m), Lao Cai Province, Vietnam – STATUS: New synonym.

*Amolops chunganensis* (Pope, 1929) was reported to occur in southern Yunnan (Mengyang) by YANG (1991a). In 1995, WU & TIAN described a new species, *Amolops mengyangensis*, from specimens previously reported as *Amolops chunganensis*. OHLER et al. (2000) reported the presence of *Amolops chunganensis* in northern Vietnam. These specimens (MNHN 1999 5799-5813) are the same biological species as those described as *Rana daorum* by BAIN et al. (2003). Comparison of the hypodigm of *Amolops mengyangensis* (fig. 1a) with topotypes of *Rana daorum* (fig. 2a), as well as re-evaluation of the characters indicated by BAIN et al. (2003), in particular absence of vomerine teeth, small tympanum/eye ratio and morphometric data (tab. 1), support the synonymy of the two nominal species.

These frogs can be assumed to be a different taxon from *chunganensis* as proposed by WU & TIAN (1995) and BAIN et al. (2003), but should be placed in the genus *Amolops*, because of the presence of a continuous fold on the ventrolateral border of their toe pads and their long legs, similar to the species *Amolops monticola* (Anderson, 1871) and *Amolops chunganensis*. These species of *Amolops* have dorsolateral folds, white upper lip and toe pads that are rounded but not transversally enlarged as in *Amolops formosus* (Gunther, 1876) or allied species, nor pointed as in *Odorrana* (OHLER & DUBOIS, 1989).

*Amolops chunganensis* was described from Fujian and has been reported from southeastern and western China (FEI, 1999). It should be removed from the species lists of amphibians of Vietnam and Yunnan as the vouchers are specifically identical with *Amolops mengyangensis*.

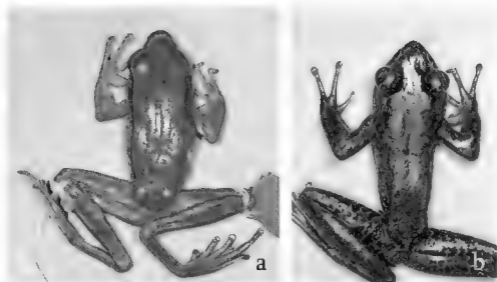


Fig 1 - (a) *Amolops mengyangensis* Wu & Tian, 1995 Holotype, CIB 579034, ♂, SVL 38.4 mm. Mengyang, Yunnan, China, in dorsal view (b) *Odorrana jingdongensis* Fet. Ye & Li, 2001 Topotype of *Rana hmongorum* Bain, Lathrop, Murphy, Orlov & Ho, 2003, MNHN 1999 5772, ♂, SVL 64.0 mm; Sa Pa, Vietnam, specimen in life in dorsal view

Table 1 Measurements of *Amolops mengyangensis* Wu & Tian, 1995, including type specimens of *Amolops mengyangensis* Wu & Tian, 1995, type specimens and topotypes of *Rana daorum* Bain, Lathrop, Murphy, Orlov & Ho, 2003. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the type specimens of *Rana daorum* which are from BAIN et al. (2003), note that their measurements of head length (in italics) have been taken on radiographs and cannot be compared to standard measures.

Measurement	<i>Amolops mengyangensis</i>		<i>Rana daorum</i>			
	Yunnan		Vietnam			
	Holotype <i>n</i> = 1	Paratypes <i>n</i> = 2	Holotype <i>n</i> = 1	Paratypes <i>n</i> = 7	Paratypes <i>n</i> = 8	Topotypes <i>n</i> = 17
SVL	38.7	38.3-38.5	55.7	34.8-38.1	53.3-57.6	36.4-48.4
HW	12.3	12.3-12.7	18.8	11.1-13.0	15.6-17.6	11.4-12.7
HL	14.4	13.4-14.2	25.4	<i>16.5-21.0</i>	<i>16.7-19.4</i>	12.7-14.4
PL	23.1	21.5-23.7	33.6	19.1-23.5	32.7-36.4	20.7-25.1

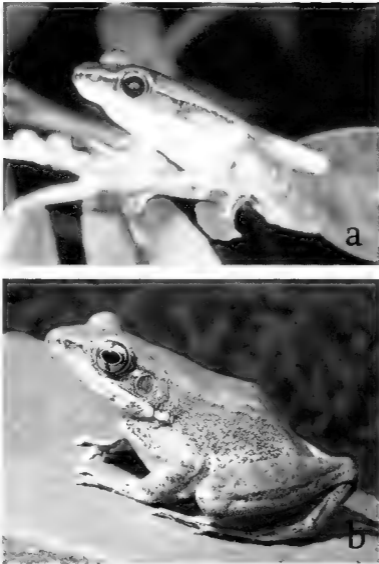


Fig 2 (a) *Anolops mengyangensis* Wu & Tian 1995. Topotype of *Rana daozum* Bain, Lathrop, Murphy, Orlov & Ho 2003, MNHN 1999 5813, ♂, SVL 37.5 mm, Sa Pa, Vietnam, specimen in life at night. (b) *Odorrana tannanensis* Yang & Li, 1980, MNHN 2004 0408, ♀, SVL 104.1 mm; Nathon, Phongsaly Province, Laos, specimen in life.

***Odorrana jingdongensis* Fei, Ye & Li, 2001**

*Odorrana jingdongensis* Fei, Ye & Li, 2001: 110 – HYPODIGM 3 ♂, 11 ♀, tadpoles ONOMATOPHORE Holotype, by original description, CIB 581505, ♀, SVL 90.4 mm ONYMATOPF 新平山 (24°45'N, 100°75'E; alt. 1480 m), Jingdong Xian, Yunnan Sheng, China.

*Rana hmongorum* Bain, Lathrop, Murphy, Orlov & Ho, 2003: 40 – HYPODIGM: 15 ♂, 24 ♀, 5 young ONOMATOPHORE Holotype, by original designation, ROM 26376, ♀, SVL 86.8 mm ONYMATOPF Approximately 5 km NW of Sa Pa Village, near O Qui Ho Pass (22°20'09"N, 103°50'14"E, alt. 1400 m), Lao Cai Province, Vietnam. – STATUS: **New synonym**

Until 2001, the name *Odorrana andersoni* was used for a group of sibling species of frogs occurring over a large range in southern China and the northern Oriental region. *Rana andersoni* Boulenger, 1882 had been first described as *Polypedates yunnanensis* Anderson, 1879 from Hotha valley in Yunnan. As this name was then a secondary homonym in the genus *Rana* Linnaeus, 1758, BOULENGER (1882) coined a replacement name. The only extant syntype (BMNH 1947 2 2 60) is a subadult male of 50.0 mm in SVL. FEI et al. (2001) revised the frogs of the *andersoni* group and described two new species from China, thus limiting *Odorrana andersoni* to north-western Yunnan (Longling and Tengchong Counties).

Without reference to the works of the Chinese authors and without comparison with the syntypes of *Polypedates yunnanensis*, BAIN et al. (2003) described *Rana hmongorum* from Sa Pa based on specimens similar to those called *Rana andersoni* by BOURRET (1942) and OHLER et al. (2000) (fig. 1b). BAIN et al. (2003) gave differences to specimens allocated to *Rana andersoni* but without indicating origin of these specimens or collection references. As they did study neither type specimens nor topotypical specimens of the existing or newly coined species group names, their conclusions are not convincing, and as we do not have any information on the voucher specimens referred by them to *Rana andersoni*, their comparisons are useless as several new taxa have been recognized in this group recently. Comparisons are here provided for morphometric data (tab 2) concerning the purported diagnostic characters of *Odorrana jingdongensis* and *Rana hmongorum*. In these species, the discs of fingers are moderately expanded, indicated as 1.4 times the width of third fingers in the description of *Odorrana jingdongensis*, and as less than twice the base of phalanges in the description of *Rana hmongorum*. All fingers have lateroventral grooves joining terminally very closely in *Rana hmongorum*. For both species terminal phalanges are described as T-shaped. The animal pole of eggs is described as unpigmented in *Odorrana jingdongensis* and as white in *Rana hmongorum*. Geographical distribution is continuous as the onymotopes of *Odorrana jingdongensis* and *Rana hmongorum* are in the same mountain range. On the basis of morphological character study, *Rana hmongorum* should be considered a junior subjective synonym of *Odorrana jingdongensis*, with the valid name *Odorrana jingdongensis*.

***Odorrana tiannanensis* (Yang & Li, 1980)**

*Rana tiannanensis* Yang & Li, 1980: 261 – HYPODIGM 2 ♂, 4 ♀, – ONOMATOPHORE: Holotype, by original designation, KIZ 77.1 0185 / 57.5 mm. – ONYMATOPF, Dawei Shan (alt. 1200 m), Hekou Xian (22°31'N, 103°59'E), Yunnan Sheng, China



Table 2 Measurements of *Odorrana jingdongensis* Fei, Ye & Li, 2001, including type specimens of *Odorrana jingdongensis* Fei, Ye & Li, 2001, type specimens and topotypes of *Rana hmongorum* Bain, Lathrop, Murphy, Orlov & Ho, 2003. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the type specimens of *Odorrana jingdongensis* which are from FEI, YE & LI (2001) and those of the type specimens of *Rana hmongorum* which are from BAIN et al. (2003); note that measurements of head length by the latter (in italics) have been taken on radiographs and cannot be compared to standard measures. The maximum value for TL in ♂ paratypes of *Rana hmongorum* given as 51.2 mm (in bold) is probably in fact close to 41.2 mm.

Measurement	<i>Odorrana jingdongensis</i>		<i>Rana hmongorum</i>			
	Yunnan		Vietnam			
	Paratypes ♂ n = 5	Holotype and paratypes ♀ n = 19	Topotypes ♂ n = 8	Topotypes ♀ n = 2	Paratypes ♂ n = 12	Holotype and paratypes ♀ n = 10
SVL	62.0-81.5	64.7-108.0	52.9-64.0	75.0-77.7	54.7-65.3	74.3-86.8
HW	20.5-26.6	20.6-36.4	19.5-22.3	27.3-27.6	18.9-21.1	29.2-31.3
HL	21.3-29.4	23.5-38.4	21.1-23.3	28.7-29.6	<i>20.7-30.4</i>	<i>37.0-42.3</i>
TL	37.7-47.7	39.3-61.9	35.5-39.7	45.7-47.7	33.4 <b>51.2</b>	43.1-49.2

*Rana megalympanum* Bain, Lathrop, Murphy, Orlov & Ho, 2003: 50 – HYPODIGM 4 ♂, 11 ♀. ONOMATOPHORE: Holotype, by original designation, ROM 39684, ♀. SVL 93.6 mm – ONYMOTOPE: Khe Moi River (18°56'30"N, 104°48'35"E), approximately 24 km west of Con Cuong village (by road), Con Cuong District, Nghe An Province, Vietnam – STATUS: **New synonym**

*Rana heatwolei* Stuart & Bain, 2005: 487 – HYPODIGM 6 ♂, 5 ♀ – ONOMATOPHORE: Holotype, by original designation, FMNH 258134, ♂. SVL 57.3 mm – ONYMOTOPE: Tributary of Nam Ou River (22°05'38"N, 102°12'50"E), Phou Dendin National Biodiversity Conservation Area, Phongsaly District, Phongsaly Province, Laos – STATUS: **New synonym**

*Rana tiamnensis* was described by YANG & LI (1980) from Hekou, southern Yunnan. It is still known only from a few places close to the Lao-Vietnamese border (YANG, 1991a, FEI, 1999). In 2003, BAIN et al. described a frog from northern Vietnam, *Rana megalympanum*, that they considered close to *Rana tiamnensis* but being nevertheless a distinct species because of absence of a vertical lip stripe (present in *R. tiamnensis*), absence of dorsolateral folds in males and discs of toes larger than those of fingers. STUART & BAIN (2005) described a species close to *R. megalympanum* from northern Laos, *Rana heatwolei*, which can be distinguished from the Vietnamese form by the presence of spinules on back and venter and the presence of small dark brown spots.

New material available from northern Laos (Phongsaly Province) adjacent to the Chinese locality of *Rana tiamnensis* and study of descriptions in the Chinese literature (FEI, 1999) show that *Rana tiamnensis* (fig. 2b) cannot be distinguished by any of these characters

Table 3. – Measurements of type specimens of *Odorrana tiannanensis* (Yang & Li, 1980) including type specimens of *Rana tiannanensis* Yang & Li, 1980 and of *Rana megatympenum* Bain, Lathrop, Murphy, Orlov & Ho, 2003, and other specimens allocated to this taxon. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the type specimens of *Rana tiannanensis* which are from YANG & LI (1980), and those of the type specimens of *Rana megatympenum* which are from BAIN et al. (2003); note that measurements of head length by the latter (in italics) have been taken on radiographs and cannot be compared to standard measures.

Measurement	<i>Rana tiannanensis</i>				<i>Rana megatympenum</i>	
	Yunnan		Laos		Vietnam	
	Holotype and paratype ♂ n = 2	Paratypes ♀ n = 4	♂ n = 8	♀ n = 1	Paratypes ♂ n = 4	Holotype and paratypes ♀ n = 10
SVL	52.3-53.5	90.5-107.6	45.9-56.7	100.2	48.6-55.2	93.6-105.3
HW	19.1-19.3	33.0-34.5	16.0-20.2	36.0	18.0-19.1	34.1-35.7
HL	20.5-20.8	36.0-38.6	18.0-22.2	37.7	<i>24.6-27.1</i>	<i>41.3-47.6</i>
TL	33.6-34.0	63.2-67.5	31.0-35.1	65.7	32.3-33.1	55.8-67.7
TYD	5.1-5.3	5.35-5.8	6.4-7.9	6.0	4.3-5.1	4.6-5.9

from *Rana megatympenum* or *Rana heatwolet*. Differences are due to incomplete descriptions based on specimens of a single sex and reproductive stage. Striped lips are present in females of specimens allocated to *Rana tiannanensis* (FRT, 1999) as they are in specimens allocated to *Rana megatympenum*. The sexual dimorphism in tympanum size can be confirmed for populations allocated to both species (tab. 3). Ranges of adult size of males and females correspond. Comparison to the newly described *Rana heatwolet* Stuart & Bain, 2005 shows that Lao specimens from Nam Ou valley (onymotope of *R. heatwolet*) share distinct small spots with this new taxon but do not have spinules on body. In conclusion and reconsidering character distribution, *Rana megatympenum* and *Rana heatwolet* should be treated as junior subjective synonyms of *Rana tiannanensis*, with the valid name *Odorrana tiannanensis*.

### ***Pelophylax lateralis* (Boulenger, 1887)**

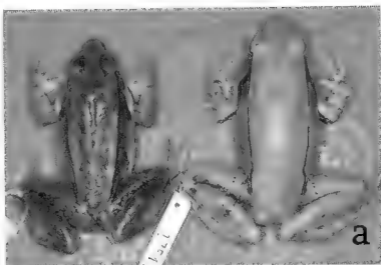
*Rana lateralis* Boulenger, 1887: 483. HYPODYGMA 1 ♂. ONOMATOPOREI. Holotype, by monotypy, MSNG 29324, ♂, SVL 53 mm. ONYMATOPE: Kokarri ["Kaw-ka-net"] (98°14'E, 16°33'N), east of Moulmein, Karen State, Myanmar.

*Rana nigrolineata* Liu & Hu, 1959: 510, 516. HYPODYGMA 10 ♂, 8 ♀. ONOMATOPOREI. Holotype, by original designation as "type", CIB 571685, ♂, SVL 50.5 mm. ONYMATOPE: Mengyang (21°37'N, 101°22'E, alt. 680 m), Xishuanbanna Dai-Zu Zizhizhou, Yunnan Province, China. STATUS: **New synonym**.

Table 4. Measurements of *Pelophylax lateralis* (Boulenger, 1887), including holotype of *Rana lateralis* Boulenger, 1887, type specimens of *Rana nigrolineata* Liu & Hu, 1959 and other specimens allocated to this taxon. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the holotype of *Rana lateralis* which are from BOULENGER (1920) and those of the type specimens of *Rana nigrolineata* which are from LIU & HU (1959).

Measurement	<i>Rana lateralis</i>			
	Myanmar		Laos	
	Holotype ♂ n = 1	♂ n = 1	♂ n = 9	♀ n = 1
SVL	47	51.8	42.5-46.9	48.8
HW	17	17.6	15.7-17.1	16.8
HL	16	18.9	16.4-18.1	17.8
TL	23	24.1	21.7-23.6	-23
Measurement	<i>Rana lateralis</i> Thailand		<i>Rana nigrolineata</i> Yunnan	
	♂ n = 3	♀ n = 3	Holotype and paratypes ♂ n = 10	Paratypes ♀ n = 8
SVL	52.4-55.0	58.8-67.5	43.0-52.5	51.0-61.3
HW	18.5-22.0	20.9-22.3	14.5-18.4	18.0-21.8
HL	19.2-20.0	21.8-23.0	16.0-20.4	18.9-22.0
TL	23.6-24.7	26.9-31.3	22.5-28.4	26.8-33.0

This frog was originally described from Myanmar. It is currently known to occur in Cambodia, Laos, Thailand and Vietnam. In southern Yunnan, a species of *Pelophylax*, *Rana nigrolineata*, with transversal dorsal stripes, was described by LIU & HU (1959). I had the opportunity to study the holotype of *Rana nigrolineata* and material from near the onymotope of *Rana lateralis* in Myanmar (fig. 3), which prove very similar in general coloration pattern, skin structure and webbing. The holotype of *Rana lateralis* has no oblique dark bands on back according to its original description (BOULENGER, 1887), but oblique granular folds (BOULENGER, 1912). Other specimens from Cambodia (unpublished data), Laos (MNHN 1997-4097-4088), Myanmar (BMNH 1893.10.9.16, MNHN 1893.0456) and Thailand (MNHN field numbers 17543-17544, Y0041-0044) show those stripes more or less distinctly either as granular folds or as dark stripes. In the diagnosis of *Rana nigrolineata*, presence of oblique stripes in all specimens was mentioned (LIU & HU, 1959: 530), as well as external vocal sacs. Vocal sacs of *Rana lateralis* were said to be internal in the holotype, present in specimens from Thailand (TAYLOR, 1962), and appear as external foldings on sides



of the throat in specimens from Laos and Thailand. As internal openings of vocal sacs are present in the holotype, the absence of external sacs may be due to age or reproductive stage of the specimen which is either a subadult or a non-reproductive male. In samples from a single locality, coloration and presence of oblique bands is very variable and cannot be used as a discriminating character. I could measure the holotype of *Rana nigrolineata* and specimens from Laos, Myanmar and Thailand. Comparison of these frogs with those from Yunnan (LIU & HU, 1959) shows minor variation in size (SVL) ( $\delta$  RE = 1.29;  $\text{♀}$  RE = 1.39) (tab. 4) and measurements are largely overlapping between all samples. Considering morphological similarity, colour pattern and morphometrics, *Rana nigrolineata* should be considered a junior subjective synonym of *Rana lateralis*.

### *Sylvirana cubitalis* (Smith, 1917)

*Rana cubitalis* Smith, 1917: 277. HYPODIGM 2  $\delta$  - ONOMATOPHORE. Holotype, by original designation as "type", BMNH 1947.2.2.35 [ex BMNH 1921.4.1.228, ex MAS 1106],  $\delta$ , SVL 66.8 mm (given as 68 mm in SMITH, 1917) - ONYMOTOPE. Doi Nga Chang (alt. 490 m [1600 ft]), [northern Siam, precise locality unknown because name has probably changed], Thailand - COMMENTS. According to SMITH (1930: 104), the male described and measured by BOULLANGER (1920: 138-139) is not the holotype.

*Rana* (*Sylvirana*) *nigrotympanca* Dubois 1992: 326. HYPODIGM 1  $\text{♀}$ , 3 tad - ONOMATOPHORE. Holotype, by original designation, CIB 571162,  $\text{♀}$ , SVL 6.5 mm. Description and figures of holotype. LIU & HU, 1959: 518, fig. 4.1-3, 1961: 201, fig. 63.1-3 - ONYMOTOPE. Mengyang (21°37'N, 101°22'E), Xishuanbanna Daizu Zizhuzhou, Yunnan Sheng, China - STATUS. **New synonym**

*Sylvirana cubitalis*, first described by SMITH (1917) from Myanmar (fig. 4), is a frog species with a large distribution in northern Thailand. The males are easily recognized because they have a prominent glandular patch of nuptial spines on the forearm unique among ranine frogs. For thirty years, the Philippine species *Rana varians* Boulenger, 1894 was considered to occur in southern China. On morphological data, particularly on the difference in tadpole mouth structure, DUBOIS (1992) distinguished the Chinese form as *Rana nigrotympanca* (fig. 5a). This species was only known from three female specimens (LIU & HU, 1961; YANG, 1991a). Description of holotypes of these two nominal species will be published elsewhere (OHLER & DUBOIS, in prep.). STUART et al. (2006) published a redescription of this frog from northern Laos as *Rana nigrotympanca* and compared it briefly with *Rana cubitalis*. In the specimens they studied, vocal pouches are absent.

Recent collections in northern Laos adjacent to the onymotope of *Rana nigrotympanca* included a frog species whose females fit with the Chinese form in having a distinct dark triangle at the tympanic region, but the males have the sexual characters of *Rana cubitalis* (fig. 6). Morphometrical data on Lao specimens and types are given in table 5 and support similarity of the frogs from different populations. Though there is variation in size, the observed values for RE are not particularly high ( $\delta$  RE = 1.30,  $\text{♀}$  RE = 1.32). As

Fig. 3 - *Pelophylax lateralis* (Boulenger, 1887). Specimens in dorsal view. (a) Left, dark coloured specimen with oblique bands, MNHN field number Y.0041,  $\delta$ , SVL 53.2 mm. Right, light coloured specimen without bands, MNHN field number 17543,  $\text{♀}$ , SVL 58.8 mm. Both specimens from Phitsanulok Province, Thailand. (b) Holotype of *Rana nigrolineata* Liu & Hu, 1959, CIB 571085,  $\delta$ , SVL 50.5 mm; Mengyang, Yunnan, China.

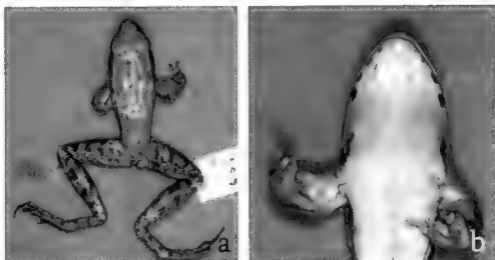


Fig 4 *Sylvirana cubitalis* (Smith, 1917) Holotype of *Rana cubitalis* Smith, 1917, BMNH 1947.2.2.35, ♂, SVL 66.8 mm, Doi Nga Chang, Thailand (a) Dorsal view (b) Ventral view of throat and right forearm showing glandular pad.



Fig 5 (a) *Sylvirana cubitalis* (Smith, 1917) Holotype of *Rana + Sylvirana nigrotympanica* Dubois 1992, CIB 571162, ♀, SVL 61 mm, Mengyang, Yunnan, China, dorsal view (b) *Sylvirana milleti* (Smith, 1921), Syntype of *Rana milleti* Smith, 1921, BMNH 1947.2.1.45 [ex MAS 2602], ♀, SVL 36.2, Da Lat, Lam Dong Province, Vietnam; dorsal view



Fig 6 (a) *Sylvirana cubitalis* (Smith, 1917) MNHN 2005 0224. ♂, SVL 52.4 mm, Long Nai, Phongsaly Province, Laos, specimen in life (b) *Sylvirana milkii* (Smith, 1921) MNHN 2004 0370. ♂, SVL 40.3, Long Mai Khao, Phongsaly Province, Laos; specimen in life

morphological data are available only on small samples of this species (21 ♂, 10 ♀), conclusions on variation must be prudent. In specimens collected in Phongsaly Province (MNHN 2005 0224-0230), adult males have more or less distinct foldings on sides of throat but no extended vocal pouch. In the male specimens described by SRI ART et al. (2006), vocal pouches were absent. SMITH (1917) described these pouches as external, whereas BOULINGER (1920: 139), BOURRIT (1942: 317) and TAYLOR (1962: 426) mentioned internal vocal sacs. Study of the type specimens (BMNH 1947 2 2 36 [ex MAS 1106] and 1921 4 1 229 [ex MAS 2107]) confirms the vocal pouches being internal without morphological modification on throat (fig 4b). Thus the description of SMITH (1917) is wrong and does not

Table 5. Measurements of *Sylvirana cubitalis* (Smith, 1917), including type specimens of *Rana cubitalis* Smith, 1917, holotype of *Rana (Sylvirana) nigrotympanica* Dubois, 1992 and other specimens allocated to this taxon. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the Yunnan specimens of *Rana nigrotympanica* which are from YANG (1991a).

Measurement	<i>Rana cubitalis</i>			
	Myanmar		Thailand	
	Holotype ♂ n = 1	Paratype ♂ n = 1	♂ n = 3	♀ n = 4
SVL	66.8	64.8	55.2-67.8	60.7-75.2
HW	20.8	18.3	15.6-20.9	19.1-22.1
HL	23.2	21.0	20.1-24.5	22.9-26.5
TL	39.1	37.4	29.5-40.7	35.5-42.6
Measurement	<i>Rana nigrotympanica</i>			
	Yunnan		Laos	
	Holotype ♀ n = 1	♀ n = 2	♂ n = 4	♀ n = 3
SVL	57.1	63.5-65	51.4-57.2	59.4-66.6
HW	18.2	19-19.5	14.7-16.8	18.6-19.8
HL	21.0	21.5-22	19.1-20.4	21.9-23.5
TL	35.3	37-39	29.8-34.0	34.0-39.1

provide a discriminant character as supposed by STUART et al. (2006). In conclusion, the name *Rana nigrotympanica* refers to the female of *Rana cubitalis*, and the name *Rana nigrotympanica* is a junior subjective synonym of *Rana cubitalis*, with *Sylvirana cubitalis* as its valid name.

#### *Sylvirana milleti* (Smith, 1921)

*Rana milleti* Smith, 1921: 431. HYPODIGM 5 ♂, 5 ♀. ONOMATOPHORE Syntypes, BMNH 1947.2.1.37-46, 5 ♂, 5 ♀, SVL respectively 35.0-37.9 mm and 44.4-47.8 mm. ONYMATOPHORE Da Lat (Dalat) (11°58'N, 108°24'E), Langbian Plateau, Lam Dong Province, Vietnam.

*Rana hammanica* Rao & Yang, 1997: 157. HYPODIGM 8 ♂. ONOMATOPHORE Holotype, by original designation, KIZ 94001, ♂, SVL 43.0 mm. ONYMATOPHORE Mo-han (21°10'N, 101°45'E, alt. 850 m), China-Laos border, Xishuangbanna Dai-zu Zizhizhou, Yunnan Sheng, China. STATUS New synonym.

SMITH (1921) described *Rana milleti* from the Lang Bian Plateau of central Vietnam (fig. 5b). The species was known only from this region until the recent discovery of the species



Table 6. - Measurements of *Sylvirana milleti* (Smith, 1921), including type specimens of *Rana milleti* Smith, 1921 and of *Rana bannanica* Rao & Yang, 1997, and other specimens allocated to this taxon. Measurements (minimum-maximum) are given in millimetres. Measurements are original except for those of the type specimens of *Rana bannanica* which are from RAO & YANG (1997)

Measurement	<i>Rana milleti</i>			
	Vietnam		Thailand	
	Syntypes ♂ n = 5	Syntypes ♀ n = 5	♂ n = 14	♀ n = 1
SVL	35.0-37.9	44.4-47.8	38.3-41.7	49.4
HW	12.3-12.8	14.4-15.5	11.3-12.9	15.7
HL	13.2-14.2	16.6-18.5	14.6-16.1	18.8
TL	18.9-20.3	24.2-26.4	21.0-23.2	26.7
Measurement	<i>Rana bannanica</i>			
	Yunnan		Laos	
	Holotype ♂ n = 1	Paratypes ♂ n = 7	♂ n = 6	♀ n = 1
SVL	43.0	38.0-43.0	37.5-41.1	45.6
HW	14.0	12.0-14.0	12.0-13.5	14.7
HL	17.0	15.0-17.0	15.1-16.1	17.5
TL	22.0	20.0-23.0	18.7-22.9	23.9

from Thailand and Cambodia (CHUAYNKERN et al., 2004). In 1997, RAO & YANG described a brown *Rana* similar to *Rana nigrovittata* from the China-Laos border.

When doing field work in Phongsaly province of Laos, near to the Chinese border, I discovered a small brown frog (fig. 6b) which corresponds in morphological characters closely to the description of *Rana bannanica*, but also to the type specimens and other specimens studied of *Rana milleti*. These two forms are the only *Sylvirana* that share the following characters: small body size, moderately large head, reduced webbing, dorsal skin bearing glandular warts and dense horny spinules. Morphological analysis shows no major differentiation but a slightly smaller size in the syntypes from Vietnam (tab. 6), but size variation is of small or moderate amplitude (♂ RE = 1.23, ♀ RE = 1.11). Smaller size is not correlated to any other character of shape, morphology or coloration. Pending genetic data, *Rana bannanica* should be regarded a junior subjective synonym of *Rana milleti*, with the valid name *Sylvirana milleti*. The distribution area of the species is extended far north to southern Yunnan. Rarity of records may be due to problems of taxonomic allocation (some specimens could be regarded as juveniles of "*nigrovittata*") but also due to ecological demands. Specimens have been collected in marshes and ponds close to forests or in primary

forest. As pointed out by OHLER & DELORME (2006), this kind of habitats is particularly rare in Asia as most of lowland forests and forests on non-sloping parts have disappeared to be replaced by paddies.

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## APPENDIX I

### SPECIMENS STUDIED

- Amolops mengyangensis* CHINA: Yunnan Sheng, Mengyang, CIB 579034, CIB 579037, CIB 6411901, ♂. VIETNAM: Lao Cai Province, Sa Pa, MNHN 1999 5799-5813, ♂.
- Odorrana jingdongensis*, VIETNAM: Lao Cai Province, Sa Pa, MNHN 1938 0054-0057, MNHN 1999, 5762-5781, topotypes of *Rana hmongoran*, ♂, ♀, juv.
- Odorrana tuannuensis* LAOS: Phongsali Province, Nathen, MNHN 2004 0408, ♀, Houey Phihet, MNHN 2005.0180-0188, ♂.
- Pelophylax lateralis* CHINA: Yunnan Sheng, Mengyang, CIB 571085, holotype of *Rana nigrolmeata*, ♂, CIB 570392, paratype of *Rana nigrolmeata*, ♀. LAOS: Vientiane market MNHN 1997 4079-4088, ♂, ♀. MYANMAR: Rangoon, BMNH 1893 10 9 16, ♂, MNHN 1893 0456, ♂. THAILAND: Phitsanulok Province, Nam Pad District, MNHN field number Y0041-0044, ♂, ♀.
- Sylvirana cubitalis*, LAOS: Phongsali Province, Long Mai Kao, MNHN 2005 0224-0227, ♂, ♀, Nathen, MNHN 2005 0228, ♂, Houey Phihet, MNHN 2005 0229, ♀, Ban Phoumouang, MNHN 2005 0230, ♀. THAILAND: "Doi Nga Chang", BMNH 1947 2 2 36, holotype of *Rana cubitalis*, ♂, BMNH 1921 4 1.229, ♂, FMNH 135341-2, ♂, ♀; Loet Province, Dansai District, FMNH 196016, ♀, FMNH 125017, ♂, Chiang Mai, FMNH 173953, ♀, FMNH 125945, ♂, FMNH 51288, ♀.
- Sylvirana milleti* LAOS: Phongsali Province, Long Mai, MNHN 2004 0370-0376, ♂, ♀. THAILAND: Khao Yai, MNHN 1987.3433-3444, ♂. VIETNAM: Langbian Plateau, BMNH 1947 2 1 37-46, syntypes of *Rana milleti*, ♂, ♀.